

**Final Work Plan Addendum
for the
Phase II RCRA Facility Investigation
of
Sites 2D, 2E, 15 and 25**

**Oceana Naval Air Station
Virginia Beach, Virginia**

Prepared for

**ATLANTIC DIVISION NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia**

Contract N62470-93-D-4072

Prepared by



March 1994

Certification

I certify that the information contained in or accompanying this RCRA Facility Investigation Phase II work plan addendum is true, accurate, and complete.

As to those identified portion(s) of this RFI work plan addendum for which I cannot personally verify their accuracy, I certify under penalty of law that this RFI work plan addendum and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Date: _____

Signature: _____

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WDCR764/006.WP5

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Section 1 Introduction

This work plan addendum describes future activities at 4 of the 17 RCRA sites investigated during the RCRA Facility Investigation (RFI) at the Naval Air Station (NAS) Oceana in late 1992 and early 1993. This addendum is an update of the June 1992 RFI work plan (CH2M HILL, 1992). It incorporates and summarizes data from the RFI reported in the RFI draft report dated June 1993 (CH2M HILL, 1993). Where appropriate, this addendum incorporates by reference some sections of the June 1992 work plan and notes differences between practices during the RFI and proposed practices during Phase II of the RFI for these four sites.

A total of 17 RCRA solid waste management units (SWMUs), otherwise referred to as "sites," were investigated during the RFI. Recommendations for future action included: (1) corrective measures study (CMS), (2) petroleum-oil-lubricant (POL) site investigation and fast-track remediations, (3) additional RFI study, and (4) no further action. Twelve of the 17 sites were recommended for additional work, as shown in Table 1-1. The CMS and POL sites draft work plan addenda have been completed (CH2M HILL, 1993) and are under review. The activities at the remaining four active sites are described in this work plan addendum. The site locations are illustrated in Figure 1-1. The four sites are:

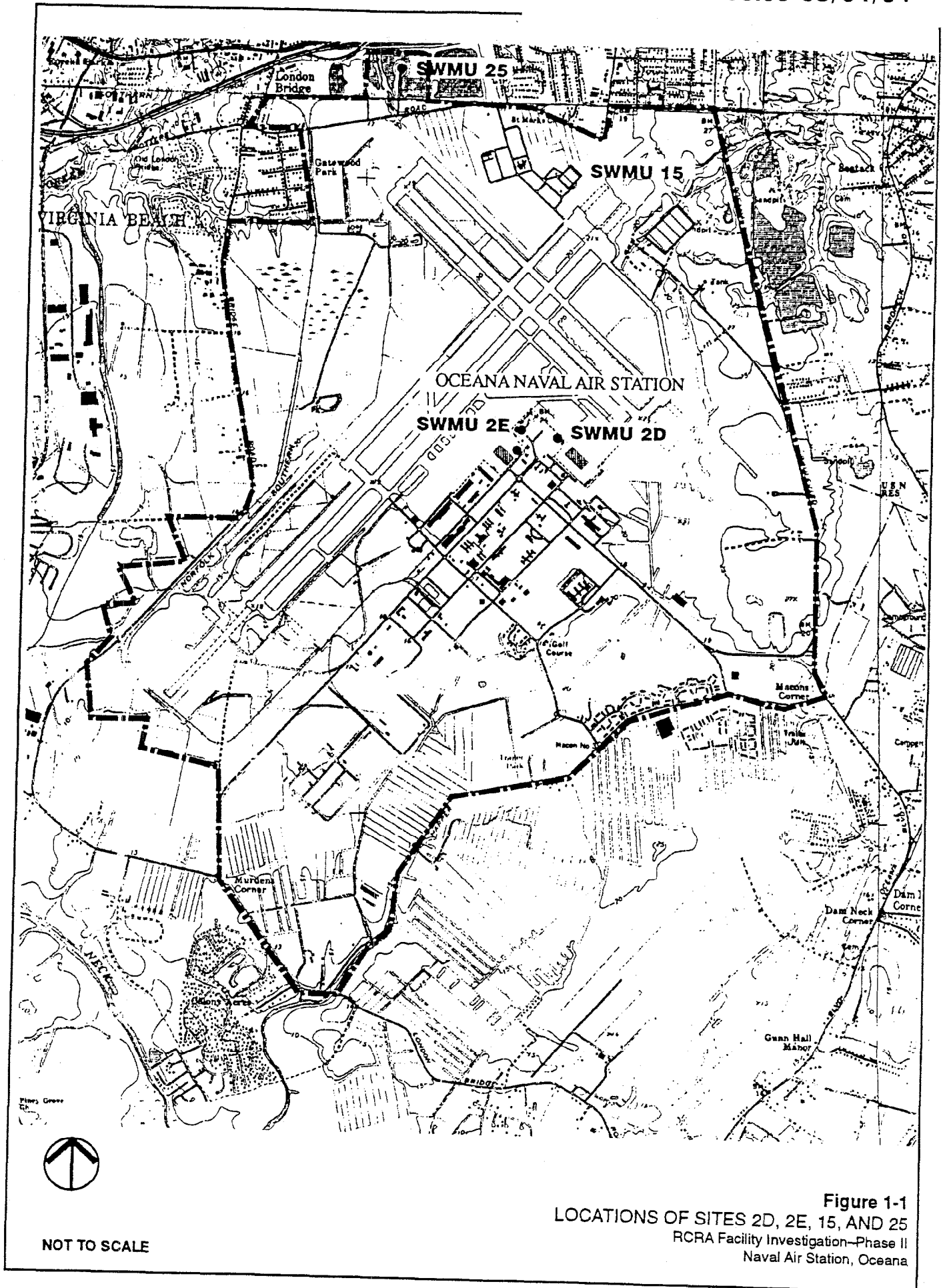
- Site 2D—Line Shack 125 Disposal Area
- Site 2E—Line Shack 109 Disposal Area
- Site 15—Abandoned Tank Farm
- Site 25—Inert Landfill

The activities described in this addendum are part of the RCRA corrective action process under a RCRA 3008(h) Consent Order issued by the U.S. Environmental Protection Agency in March 1990 and amended in May 1991 (EPA, 1991). The steps in the RCRA corrective action process are: (1) a RCRA Facility Assessment (RFA) to determine by review whether contamination problems may exist, (2) issuance of a Consent Order requiring investigation, remediation, and other activities, (3) an RFI to determine the extent and severity of the extent, (4) where applicable, a CMS of remediation options, and (5) Corrective Measures Implementation (CMI) of the selected remedial option. At NAS Oceana, the 12 remaining sites are either at the CMS stage or require additional RFI investigations before the extent is sufficiently characterized for sound decision-making. The four sites described in this plan fall into the latter group. For convenience, this additional RFI investigation will be referred to as the "Phase II RFI" in the remainder of this work plan addendum.

The purpose of this investigation is to characterize the contamination at these four sites in enough detail that a sound determination of future action can be made, and if a CMS is appropriate, enough detail to support selection of a remedy. The field investigation will

Table 1-1
STATUS OF SOLID WASTE MANAGEMENT UNITS
IN PHASE II OF THE RFI

Site	Description	Corrective Measures Study	POL Site Investigation & Remediation	Additional RFI Study	No Further Study or Remediation
1	West Woods Oil Pit	•			
2B	Line Shack 130-131 Disposal Area	•			
2C	Line Shack 400 Disposal Area	•			
2D	Line Shack 125 Disposal Area			•	
2E	Line Shack 109 Disposal Area			•	
11	Western Firefighting Training Ring		•		
15	Abandoned Tank Farm			•	
16, 16GC	Pesticide Storage Areas				•
18	Hazardous Waste Storage		•		
19	Waste Oil Storage, Bldg. 541		•		
20	Waste Oil Storage, Bldg. 543		•		
21	Transformer Storage Yard				•
22	Construction Debris Landfill				•
23	Waste Oil Bowser, Bldg. 830				•
24	Waste Oil Bowser, Bldg. 840		•		
25	Inert Landfill			•	
26	Fire Station Firefighting Training Ring				•
Notes: Refer to the RFI report (CH2M HILL, 1993) for the recommendations for each site and the rationale for future activities.					



include additional samples, as dictated by field conditions, to enhance characterization. The addendum is divided into four sections. Section 2, describing the history and past investigations at each site, follows this introduction. Section 3 is the Sampling and Analysis Plan for the investigation. It specifies sampling locations for each site, the procedures that will be used during the field investigation, and the data and analytical requirements of the investigation. Section 4 describes the project execution and management, and includes a schedule of activities.

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Section 2

Site Background and Past Investigations

NAS Oceana is in Virginia Beach in southeastern Virginia. The station is southeast of Norfolk, and immediately west of the Atlantic Ocean and south of the Chesapeake Bay. The U.S. government has operated the facility since 1940. Over the years, NAS Oceana has grown significantly and is one of the principal naval air stations in the country. The environmental setting and history of the station were described in detail in Chapter 2 of the RFI report (CH2M HILL, 1993).

Several studies of the station have been conducted in the past under the Navy's Installation Restoration (IR) program. The history of the studies and of the RCRA process is described in Chapter 1 of the RFI report. Of the four sites covered by this workplan, only Sites 2D and 2E were investigated before the Phase I RFI.

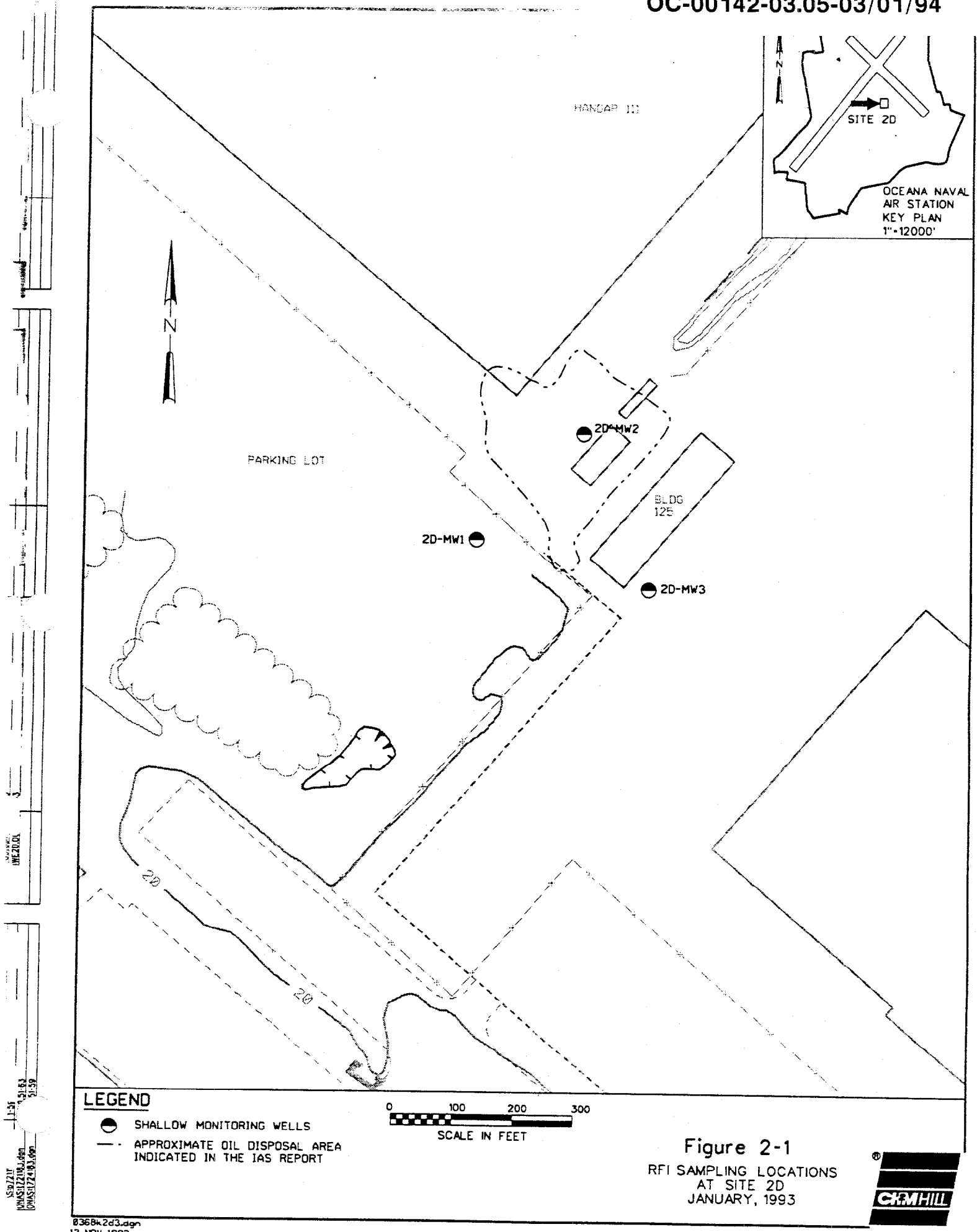
The site background of and past investigations at each of the four sites are described in sequence in this section.

Site 2D - Line Shack 125 Disposal Area

Site Location and History

Site 2D extends south-southeastward from Hanger 111 to slightly beyond Line Shack 125. The area of investigation is both inside and outside the flight line fence in the MATWING area (see Figure 2-1). Adjacent to the site within a wooded area at the edge of the parking lot is a shallow wetlands depression without outlet. Line Shack 125 was constructed in 1963. This site has been a location for aircraft cleaning and maintenance along with equipment and material storage. The IAS identified Site 2D as an area where waste chemicals from aircraft cleaning and maintenance activities were disposed. Potential contaminants that may have been released from 1963 until the early 1980s include: oil, hydraulic fluid, PD 680, and aromatic hydrocarbons used for lubrication, paint stripping, and grease removal.

In the early 1980s, the soil beneath Line Shack 125 was excavated and was found to be saturated with oily substances to approximately 6 feet (RGH, 1984, p. 2-4). During construction of a new concrete pad for the line shack in the early 1980s, a bulldozer sank several feet into oil-saturated soil after the asphalt had been scraped away (RGH, 1984, p. 8-6). Approximately 6 feet of oil-saturated soil was excavated before the new concrete pad was poured. The IAS also reported that waste liquids were formerly disposed in low areas behind Line Shack 125 (RGH, 1984, p. 5-27). This disposal area was shown in the IAS report to be within 40 feet of the northwest side of Line Shack 125 (RGH, 1984, p. 8-4) and is illustrated in Figure 2-1.



Past Investigations and RFI Site Activities

This and other line shack sites were identified as locations requiring further study in the IAS in 1984. Site 2D was investigated during the Interim RFI in 1990 (CH2M HILL, 1991) and the RFI in 1993. During the Interim RFI only one of three monitoring wells (2D-MW2) had detectable amounts of environmental contamination; however, one contaminant, 1,1 DCE, was above the Maximum Contaminant Level (MCL). As a result, the purpose of the RFI site activities at Site 2D was to obtain a second round of groundwater data to confirm this result and to determine if further investigation was required. CH2M HILL personnel resampled the three monitoring wells at Site 2D as part of the RFI field investigation. The data from the RFI confirmed the presence of contamination in 2D-MW2 and therefore support the installation of additional wells and the collection of soil samples in an effort to identify the potential source of the contamination. These data are listed in Table 2-1.

Site 2E - Line Shack 109 Disposal Area

Site Location and History

Site 2E is the area bounded by Hangar 23, Line Shack 109, Building 110, and a steam line along First Street (see Figure 2-2). Since Line Shack 109 was constructed in 1963, it has been used for aircraft cleaning and maintenance, and equipment and material storage. The IAS identified this site as a location where waste chemicals from the Navy's cleaning and maintenance activities were disposed (RGH, 1984). These wastes potentially include oil, PD 680, aromatic hydrocarbons, and hydraulic fluid (RGH, 1984). There was reported to be a POL disposal area on the ground behind Line Shack 109 along the flight line fence (RGH, 1984). Site 2E comprises both RFA SWMU 51, the line shack, and RFA SWMU 1, the Hazardous Waste Storage area. Because the storage unit is within the line shack area, the two sites were combined into Site 2E during the RFI.

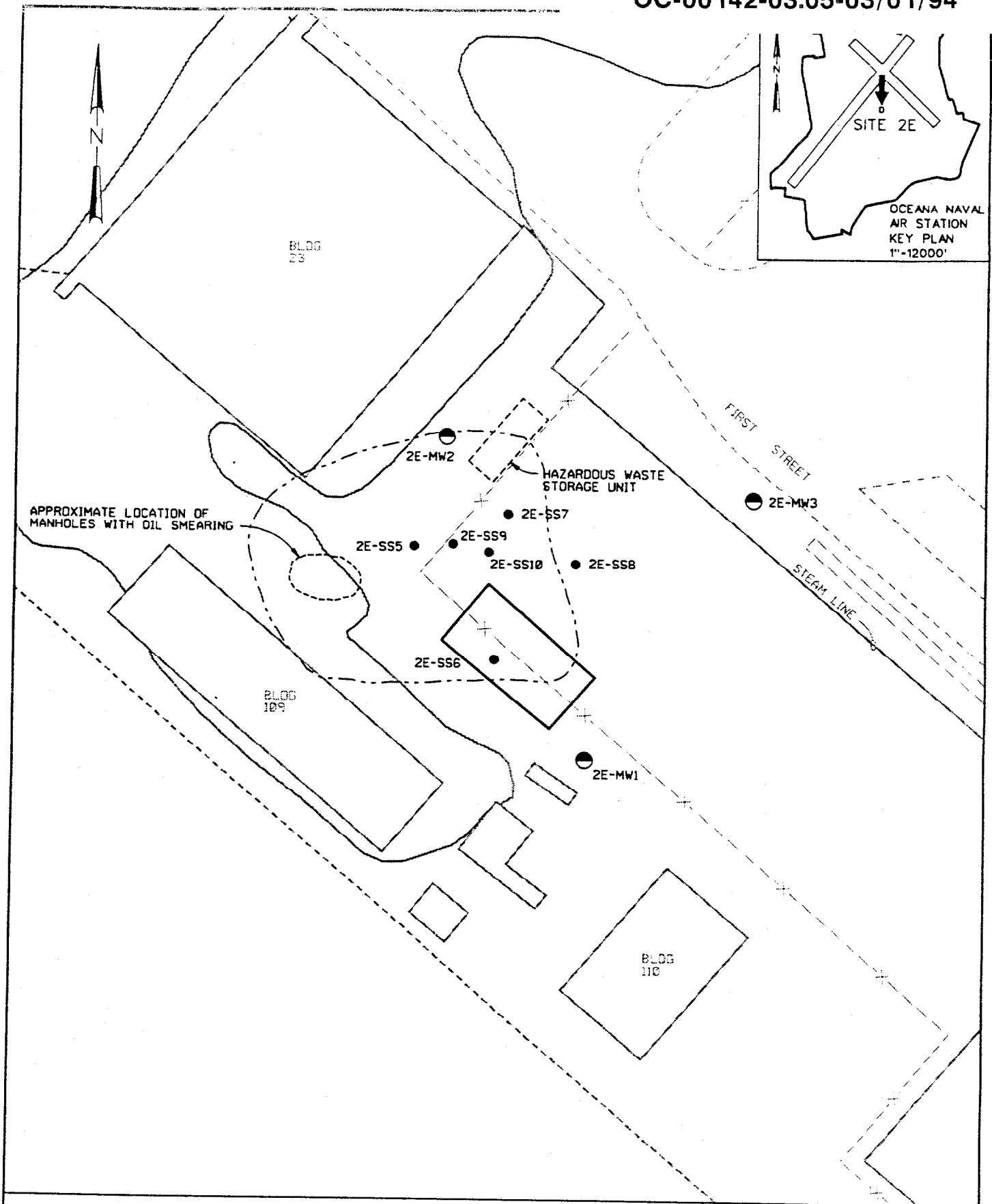
At the time of the IAS, a waste oil bowser and hazardous waste drums were seen on the ground along the fence (RGH, 1984). Waste oil was also reportedly funneled into an electric manhole near Line Shack 109 (RGH, 1984, p. 8-6). This practice damaged some electrical circuits, which prompted a cleanup of the manhole affected by the waste oil. During 1993 inspection of manholes at the site, two manholes near the south corner of Hangar 23 were found to be smeared with oil and may be the manholes referred to in the IAS. There are no manholes near well 2E-MW1. A temporary hazardous waste storage area was constructed next to the fence near Hangar 23 between 1984 and 1988.

Past Investigations and RFI Site Activities

Line Shack 109 was recommended for further investigation in the 1984 IAS and was later reviewed during the RFA in 1988. Site 2E was investigated during the Interim RFI in 1990, when three wells were installed and sampled and four soil samples were collected.

Table 2-1
ORGANIC COMPOUNDS IN GROUNDWATER AT SITE 2D, LINE SHACK 125 DISPOSAL AREA
RESULTS OF RFI AND PREVIOUS INVESTIGATION
(All Data in ppb)

Analyte	Detection Limit	2D-MW1		2D-MW2		2D-MW3		
		8/90	1/93	8/90	1/93	8/90	1/93 Initial	1/93 Duplicate
EDB	0.02	*	NA	*	NA	*	NA	NA
TPH	60	360	NA	220	NA	*	NA	NA
Volatile Organic Compounds								
Acetone	10	5 bj	5 bj	5 bj	8 j	20 b	4 j	6 j
Benzene	5	*	*	3 j	2 j	*	1 j	*
Carbon disulfide	5	*	*	*	*	1 j	*	*
1,1-Dichloroethane	5	*	*	64	56	*	*	*
1,1-Dichloroethylene	5	*	*	9	12	*	*	*
1,2-Dichloroethylene (total)	5	*	*	2 j	*	*	*	*
Ethylbenzene	5	*	*	2 j	*	*	*	*
Methylene chloride	5	4 bj	5 b	3 bj	3 bj	4 bj	2 bj	5 b
Xylenes (total)	5	*	*	6	*	*	*	*
Chloroethane	10	*	*	*	5 j	*	*	*
Semivolatile Organic Compounds								
Di-n-Butylphthalate	10	NA	NA	NA	2 j	NA	NA	NA
Polynuclear Aromatics (PAHs)	2	NA	*	NA	A	NA	*	*
Notes: EDB Ethylene Dibromide TPH Total Petroleum Hydrocarbons NA Not analyzed (*) Concentration below detection limit A PAH compounds were analyzed as part of the semivolatile analysis b Compound found in laboratory blank as well as sample j Estimated value; measured value is less than the accurately quantitative detection limit								



LEGEND

- SHALLOW MONITORING WELL
- SOIL SAMPLING LOCATIONS
- APPROXIMATE OIL DISPOSAL AREA INDICATED IN THE IAS REPORT



Figure 2-2
RFI SAMPLING LOCATIONS
AT SITE 2E
JANUARY - FEBRUARY 1993



The groundwater sampling results from the Interim RFI indicated that the parameters analyzed were either not detected or were detected at levels below the accurately quantifiable level. The same result was true of the soil data, with the exception of TPH, which was detected in two soil samples (2E-SS2 and 2E-SS3). The organic soil data are presented in Table 2-2. Other data are presented in the RFI report.

The purposes of the RFI activities at Site 2E were to obtain a second round of groundwater data to determine if further investigation was required and to determine the extent of TPH contamination in the soil. The RFI field investigation consisted of the resampling of groundwater from 2E-MW1, 2E-MW2, and 2E-MW3 and interactive soil sampling at 6 locations. CH2M HILL personnel collected six soil samples (2E-SS5 through 2E-SS10).

In contrast with the Interim RFI results, when no groundwater contaminants were detected, groundwater contamination was substantial at Site 2E during the RFI. In particular, the presence of free product in 2E-MW1 is a significant environmental concern. Since the January 1993 discovery of free product in 2E-MW1, a free product recovery program has been instituted by the NAS Oceana Public Works Department. As part of this recovery program, free product is removed from the monitoring well once a month using a bailer. Analysis of the soil samples collected during the RFI revealed TPH contamination in all samples. Three of five samples had TPH above the Virginia guidance limit of 100 mg/kg.

Site 15 - Abandoned Tank Farm

Site Location and History

This site is located in the former North Station area, approximately 800 feet northwest of Runway 23R and 1,000 feet northeast of the area used to store recreation vehicles near the old CPO officers' club (Figure 2-3). The abandoned tank farm served as the primary source of aircraft fuel for the North Station area when it was active from the mid-1950s to the mid-1970s. As shown in Figure 2-3, the tank farm consisted of six tanks: a 414,000-gallon tank used to store JP-3, two 50,000-gallon concrete tanks used for aviation gas, and three adjoining 12,000 to 18,000-gallon tanks believed to be used for automotive fuel, kerosene, or lube oil (RGH, 1984; Navy, 1957).

According to a report by R. E. Wright Associates, the tanks were emptied of fuel and filled with water after they were abandoned (R. E. Wright Associates, 1983). Tank G-5 was later used to store waste oil. The tanks and their associated piping were dismantled and removed in the mid-1980s. With the exception of some mounded earth near the former location of tank G-9, no signs of the locations of the tanks or their associated piping were observed during the RFI. Their locations were inferred from historical maps of the North Station area (Navy, 1957).

Table 2-2
ORGANIC COMPOUNDS IN SOILS AT SITE 2E, LINE SHACK 109 DISPOSAL AREA
RESULTS OF RFI AND INTERIM RFI
 (All data in µg/kg)

Page 1 of 2

Analyte	2E-SS1	2E-SS2	2E-SS3	2E-SS4	2E-SS5		2E-SS6		2E-SS7	2E-SS8	2E-SS9
	8/90	8/90	8/90	8/90	1/93		2/93		1/93	1/93	2/93
					0.5-1.0 ft.	2-3 ft.	Initial 0.5-1.0 ft.	Duplicate 0.5-1.0 ft.	0.5-1.0 ft.	0.5-1.0 ft.	2.0-3.0 ft.
TPH	99,400	513,000	242,000	NA	607,000	64,500	189,000	77,400	26,500	286,000	10,800
EDB	*	*	*	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds											
Acetone	11 bj	21 b	13 b	14 b	56 b	20 b	10 j	5 j	17 b	12 b	86 b
Methylene chloride	24 b	13 b	61 b	120 e	9 b	7 b	4 bj	4 bj	8 b	10 b	9 b
Toluene	*	*	*	2 j	*	*	*	*	*	*	*
2-Butanone	*	*	*	*	13	*	*	*	*	*	14
Xylene (total)	*	*	*	*	*	21	*	*	*	3 j	6 j
Semivolatile Organic Compounds											
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	170 bj	57 bj	NA	NA	NA
bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	43 j	*	NA	NA	NA
Polynuclear Aromatics (PAHs)											
Acenaphthene	NA	NA	NA	NA	*	35 j	*	*	*	*	*
Fluorene	NA	NA	NA	NA	*	30 j	*	*	*	*	*
Phenanthrene	NA	NA	NA	NA	*	96	*	*	110	*	*
Fluoranthene	NA	NA	NA	NA	*	64	*	*	100	43 j	*
Pyrene	NA	NA	NA	NA	*	43 j	*	*	120	*	*
Benzo(a)Anthracene	NA	NA	NA	NA	*	*	*	*	54 j	*	*

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Table 2-2
ORGANIC COMPOUNDS IN SOILS AT SITE 2E, LINE SHACK 109 DISPOSAL AREA
RESULTS OF RFI AND INTERIM RFI
(All data in µg/kg)

Page 2 of 2

Analyte	2E-SS1	2E-SS2	2E-SS3	2E-SS4	2E-SS5		2E-SS6		2E-SS7	2E-SS8	2E-SS9
	8/90	8/90	8/90	8/90	1/93		2/93		1/93	1/93	2/93
					0.5-1.0 ft.	2-3 ft.	Initial 0.5-1.0 ft.	Duplicate 0.5-1.0 ft.	0.5-1.0 ft.	0.5-1.0 ft.	2.0-3.0 ft.
Chrysene	NA	NA	NA	NA	*	*	*	*	75	*	*
Benzo(b)Fluoranthene	NA	NA	NA	NA	*	*	*	*	110	*	*
Benzo(k)Fluoranthene	NA	NA	NA	NA	*	*	*	*	110	*	*
Benzo(a)Pyrene	NA	NA	NA	NA	*	*	*	*	98	*	*
Indeno(1,2,3-CD)Pyrene	NA	NA	NA	NA	*	*	*	*	110	*	*
Benzo(g,h,i)Perylene	NA	NA	NA	NA	*	*	*	*	73	*	*

Notes:

QC sampling: 2E-SS30 is a duplicate of 2E-SS6.

NA Not analyzed

EDB Ethylene Dibromide

TPH Total Petroleum Hydrocarbons

(*) Concentration analyzed but not detected

a Detection limit range in soil for TPH samples particular to this site.

b Compound found in laboratory blank as well as sample. Sample concentration is less than 10 times blank concentration.

e Compound found in laboratory blank as well as sample. Sample concentration is greater than 10 times blank concentration.

j Estimated value. Measured value is less than the quantitative detection limit.



Past Investigations and RFI Site Activities

The earliest environmental investigation of this site was conducted by R. E. Wright Associates in 1982. Field activities included the installation of four wells (MW-1 through MW-4) and the excavation of three test pits (BP-8, BP-9, and BP-10). The locations of the wells and test pits are shown in Figure 2-3. Tank G-9 was not indicated on the figures in the 1983 R.E. Wright report, so it may have been removed before December 1982.

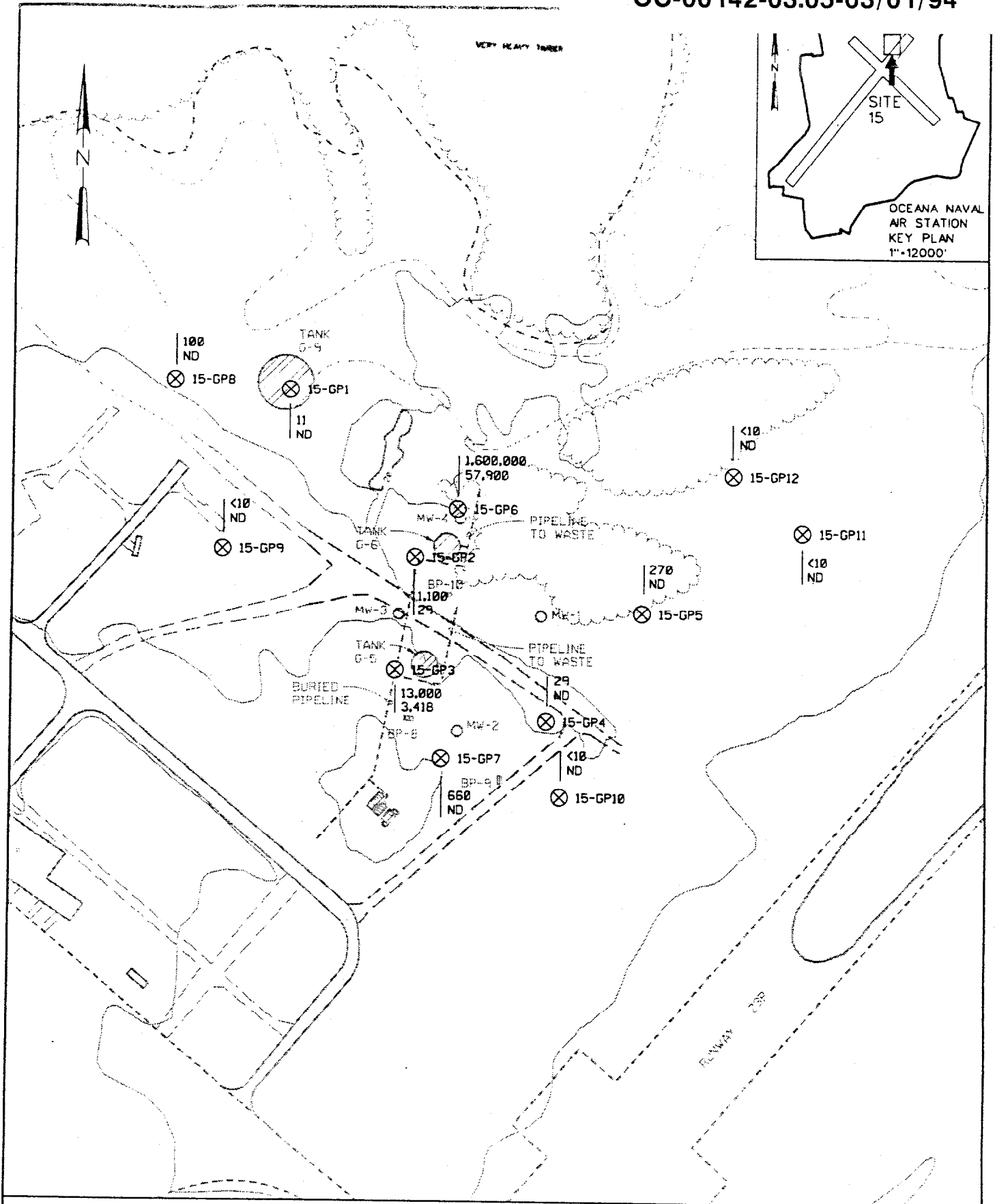
Some amount of free product fuel was observed in all three test pits and in all well borings except MW-1; however, only well MW-3 contained free product after it was completed. R. E. Wright concluded that the free product fuels observed were probably not highly mobile and that the dissolved contaminants associated with these fuels were insignificant.

Site 15 was identified as a potential hazard during the IAS in 1984. The two 50,000-gallon tanks were still present during this investigation and tank G-5 was still thought to contain approximately 5,000 gallons of waste liquids. The composition of the liquid was not known but may have contained paints, thinners, paint strippers, PD 680, engine cleaner, and naphtha in addition to waste fuels, oils and hydraulic fluid (RGH, 1984). Because the previous study had concluded that the contamination was insignificant, no additional sampling was proposed.

During the RFA in 1988, reviewers concluded that this site was potentially hazardous and recommended further sampling and study (EPA, 1988). No tanks or piping were observed during the RFA.

As part of the RFI investigation, air photos were reviewed to pinpoint the former locations of the tanks, and define their location. Before *in situ* sampling began during the RFI, a map showing the locations of the former tanks in 1957 (Navy, 1957) was located within the Public Works archives. A review of the data from the R. E. Wright investigation showed that the depth to groundwater was only 1 to 3 feet. Because the shallowness of the water table might have led to poor soil gas recovery, *in situ* groundwater samples were collected. A total of 12 *in situ* groundwater samples (15-GP1 through 15-GP12) were collected at the locations shown in Figure 2-3. Each was analyzed for BTEX compounds, total petroleum volatiles (TPV), and several chlorinated solvents using an onsite mobile lab.

During the RFI, aromatic volatiles and TPV were detected in the groundwater, and strong fuel odors were detected at most of the RFI in-situ groundwater sampling locations indicating that some fuel releases have occurred. The patterns of contamination are consistent with the northeasterly groundwater flow direction. Contamination is highest in the center of the site near tanks G-5 and G-6. An iridescent sheen of free product fuel was observed on the sampling rods at 15-GP6. The contamination extends beyond the center of the site as shown by the TPV results. TPV contaminant levels generally decrease with distance away from the center but also show a possible fuel source to the south near 15-GP7. These results are illustrated in Figure 2-4.



LEGEND

- TPV
- BTEX
- HYDRAULIC PROBE SAMPLING LOCATION

RESULTS ARE IN PPB, FROM THE MOBILE LABORATORY

Figure 2-4
DISTRIBUTION OF TPV
AND BTEX COMPOUNDS
AT SITE 15
NOVEMBER 1992



Site 25 - Inert Landfill

Site Location and History

Site 25 is a landfill filled primarily with construction debris and demolished concrete located north of Potters Road on 26 acres of land (see Figure 2-5). According to the RFA, the facility is unlined and was used as a borrow pit that supplied soil used in the construction of State Route 44. The pit was developed in a fine, sandy loam soil that has a moderately high hydraulic conductivity. Eventually, the pit filled with water and was used as a local dump. Borrow areas east of the inert landfill have also filled with water. NAS Oceana purchased the land in 1979 and received a permit from the Virginia Department of Health on May 24, 1979, permitting the disposal of inert solid waste. Waste disposal, however, may have begun as early as 1978 (RFA, 1988). NAS Oceana currently disposes of inert demolition debris at this site; however, uncontrolled community waste disposal of unknown materials took place before NAS Oceana's purchase of the site.

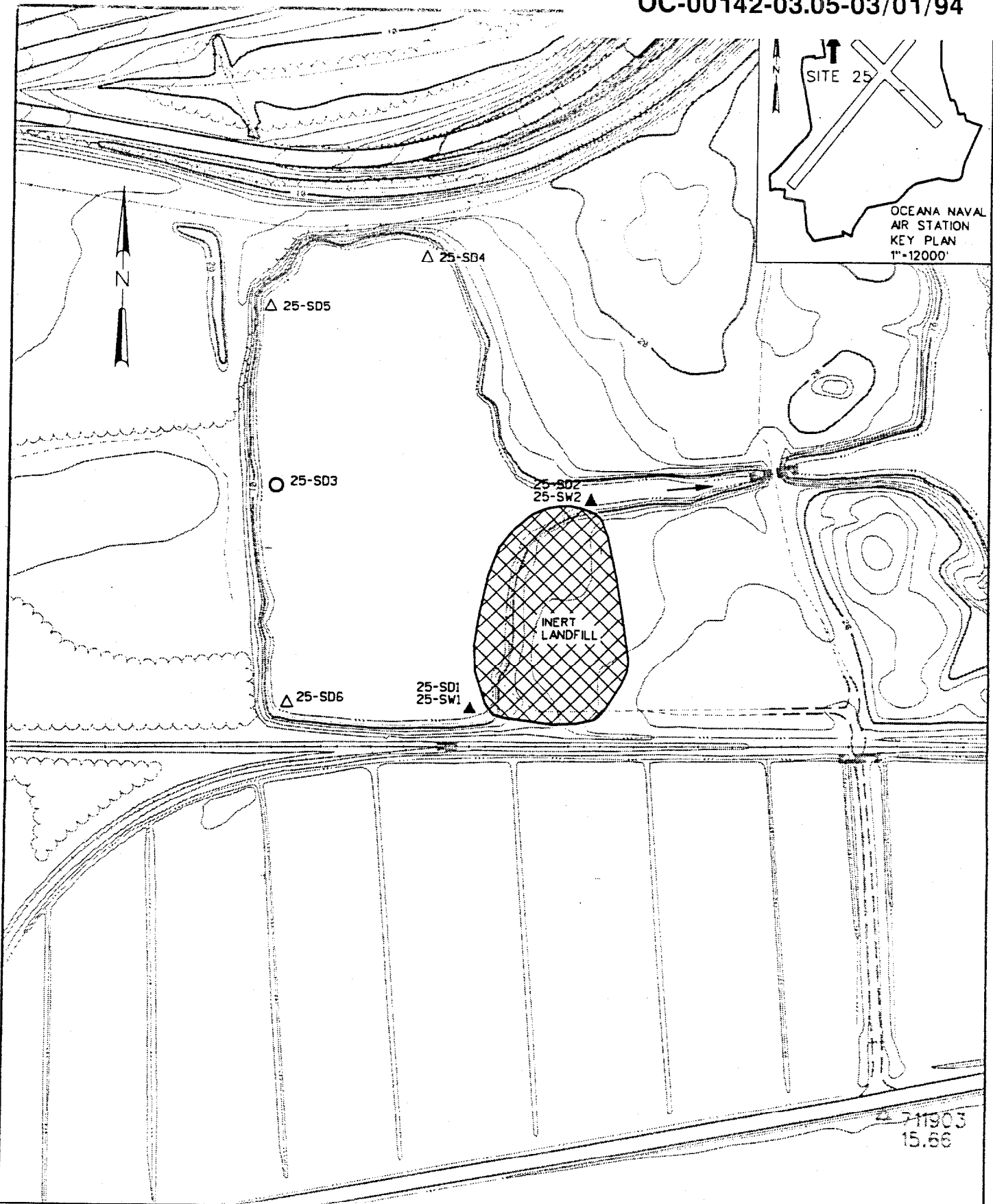
During the VSI, direct releases to the surrounding soils were observed (RFA, 1988). On the north shore of the pit, construction debris and scrap metal were present (RFA, 1988). Personnel from the State of Virginia identified wood and waste paper products at this landfill in 1981 (RFA, 1988).

The landfill was being used actively as a disposal site for concrete rubble during the RFI fieldwork. Concrete from both the MATWING and FITWING aircraft parking areas was being removed and hauled to this landfill in large pieces. The concrete pile was approximately 30 feet above grade during the RFI. The Navy is considering having a contractor grind up all the concrete rubble into small pieces and haul the material off station.

Past Investigations and RFI Site Activities

Prior to the RFI, no environmental sampling had been conducted at Site 25. Because the site was used by the public for unpermitted nuisance dumping of unknown solid wastes before it was purchased by the Navy, its inclusion in the RFI was recommended in the RFA.

The RFI field activities sought to characterize the surface water and sediment at the pond adjacent to the inert landfill. Because the analytical results indicate the presence of pesticides and metals in the pond sediment at concentrations above potentially applicable ecological guidelines, Site 25 has been included in Phase II of the investigation. The analytical results for sediment are presented in Tables 2-3 and 2-4. Other results are presented in the RFI report (CH2M HILL, 1993).



LEGEND

- SEDIMENT SAMPLING LOCATION
- ▲ SEDIMENT AND SURFACE WATER SAMPLING LOCATION
- ▨ APPROXIMATE LANDFILL BOUNDARY

0 100 200 300
SCALE IN FEET

Figure 2-5
RFI SAMPLING LOCATIONS
AT SITE 25
FEBRUARY 1993



Table 2-3
ORGANIC COMPOUNDS IN THE SEDIMENT AT SITE 25, INERT LANDFILL
 February 1993
 (All data in ppb)

Analyte	25-SD1	25-SD2	25-SD3
Volatile Organic Compounds			
Methylene chloride	12 b	10 b	18 b
Acetone	6 j	39	20
Semivolatile Organic Compounds			
Di-n-butylphthalate	240 bj	140 bj	52 bj
Phenanthrene	*	93 j	*
Fluoranthene	89 j	120 j	*
Pyrene	110 j	110 j	*
Benzo(b)fluoranthene	97 j	43 j	*
Benzo(k)fluoranthene	88 j	*	*
Benzo(a)anthracene	75 j	*	*
Chrysene	120 j	*	*
bis(2-ethylhexyl)phthalate	55 j	*	*
Pesticide/PCB Compounds			
Dieldrin	56	*	*
4,4' DDE	27	*	*
4,4' DDT	25	*	*
Organophosphorous Pesticide Compounds	NA	*	NA
Herbicide Compounds	NA	*	NA
Dioxin/furan Compounds	NA	*	NA

Notes:

All volatile, semivolatile, pesticide/PCB, organophosphorus pesticide, herbicide, and dioxin/furan compounds not listed in the table above were analyzed for but not detected.

25-SD2 was submitted for the full series Appendix IX analysis of all parameters listed above.

b - This compound was found in the associated laboratory blank as well as the sample.

j - This is an estimated value because it was detected below the accurately quantitative detection limit.

* - The compound was analyzed for, but not detected.

NA - Not Analyzed.

Table 2-4
INORGANICS IN SURFACE WATER AND SEDIMENT AT
SITE 25, INERT LANDFILL
February 1993

Analyte	Sediment (mg/kg)			Surface Water (µg/l)	
	25-SD1	25-SD2	25-SD3	25-SW1*	25-SW2*
Aluminum	4,230	NA	2,270	288 +	NA
Antimony	<4.5	<3.9 n	<3.8 n	<16.4	<16.4
Arsenic	0.65 b	0.91 b	1.0 b	0.88 b,n	1.2 b,n
Barium	17.7 b	17.4 b	7.5 b	38.5 b	38.2 b
Beryllium	0.14 b	0.17 b	0.07 b	<0.26	<0.26
Cadmium	1.3	<0.65	<0.65	<2.8	<2.8
Calcium	689	NA	73.2 b	37,100	NA
Chromium	6.0	4.3	3.9	<2.8	<2.8
Cobalt	<0.75	1.2 b	0.86 b	<2.6	<2.6
Copper	746	2.1 b	1.2 b	2.7 b	2.9 b
Iron	2,200	NA	1,240	399 +	NA
Lead	3.7	7.2 +	2.4 +	<1.7 n	<1.7 n
Magnesium	376 b	NA	205 b	6,500	NA
Manganese	15.0	NA	8.1	29.7	NA
Mercury	<0.07	<0.03	<0.03	<0.07	<0.07
Nickel	4.7 b	<2.2	<2.2	13.7 b	<9.4
Potassium	295	NA	<218	10,600	NA
Selenium	0.45 b	<0.44	<0.43	<1.8 w,n	<1.8 n
Silver	<0.31	<0.47	<0.47	<2.0	<2.0
Sodium	NA	NA	152 b	26,200	NA
Thallium	<0.42	<0.55	<0.54	<2.3	<2.3
Vanadium	6.9 b	5.7 b	3.7 b	<2.6	<2.6
Zinc	723	9.0	4.9	<9.0	15.7 b
Tin	NA	3.8 b	NA	NA	<12.7
Cyanide	NA	<0.08	NA	NA	<1.4

Notes:

< The constituent was not detected at this instrument detection limit.

25-SD2 and 25-SW2 were submitted for Appendix IX metals analysis.

*The nondetect results of selenium were rejected during the data validation process because of low spike recoveries less than 30 percent.

b = The reported value obtained was less than the contract required detection limit (CRDL), but greater than or equal to the IDL.

n = Spiked sample recovery not within control limits.

(+) = Duplicate analysis not within control limits.

Section 3

Sampling and Analysis Plan

The sampling analysis plan describes sampling locations at each site, sampling procedures, various field practices, and the quality assurance/quality control framework for the investigation. Sampling locations are presented site by site, but later sections apply to the investigation as a whole. The locations and numbers of samples are provisional. Locations will be adjusted on the basis of field observations and additional samples will be collected as needed to define areas of contamination more completely. The sampling program is summarized in Table 3-1.

Sampling Locations

Site 2D—Line Shack 125 Disposal Area

The purpose of the Phase II activities at Site 2D will be to characterize the extent of groundwater contamination at the site and attempt to identify the source of contamination in the unsaturated soil zone. Proposed activities are:

1. **Collect 5 *in-situ* groundwater samples.** The five *in-situ* sampling locations are presented in Figure 3-1. The samples (2D-GP1 through 2D-GP5) generally will be collected from a depth of 13 to 15 feet. The samples will be analyzed for field VOCs in a mobile laboratory. The volatile constituents that will be analyzed by the mobile laboratory include those previously detected at the site. They are listed in the description of *in-situ* hydraulic probe sampling in the Sampling Procedure section. The sampling depth of 13 to 15 feet was selected to ensure that the samples are retrieved from the hydrogeologic interval corresponding to the screened interval of the Site 2D monitoring wells.
2. **Collect 6 *in-situ* soil samples.** (2D-GS1 through 2D-GS6) to the water table with a Geoprobe *in-situ* sampler to identify the contaminant source. Soil sampling locations are presented in Figure 3-1. The soils will be analyzed for field VOCs on site in the mobile laboratory. Split samples will be collected at two locations and shipped to the CH2M HILL in Montgomery, Alabama where they will be analyzed for 8240 VOCs.
3. **Install 2 shallow monitoring-wells.** The proposed monitoring well locations are also indicated on Figure 3-1; however, the locations are subject to change based upon the results of the *in-situ* groundwater sampling and observations during soil sampling. While the current data show that contamination is highest in 2D-MW2, the distribution of the contaminant plume west and north of 2D-MW2 remains unknown. Installation of two new monitoring wells (2D-MW4 and 2D-MW5) will

Table 3-1
SUMMARY OF PHASE II RFI SAMPLING

Site	Type of Sample	Number of Samples	Types of Analysis, and Method
2D	In-situ groundwater	5	Field VOCs in mobile lab
	In-situ soil	6	Analyze 6 samples from borings for field VOCs, collect 2 duplicates for 8240 VOCs
	Monitoring wells	5 (Sample 2 new and 3 existing wells)	VOCs
2E	Soil borings	3 hand-augered samples (Also, 10 power-augered borings without analytical sampling)	TPH, PAHs, VOCs
	Monitoring wells	3 new wells	TPH, PAHs, VOCs
15	In-situ groundwater	8	Field VOCs in mobile lab
	In-situ soil	6	Field VOCs in mobile lab
	Monitoring wells	6	PAHs, VOCs, total and dissolved lead
25	Sediment	3	TAL metals, TCL pesticides, and percent organic carbon (total organic carbon)
Analytical methods: SW-8240 for laboratory VOCs, SW-8100 for PAHs, SW-7421 for total and dissolved lead, SW-6010/7000 for TAL metals, SW-8080 for TCL pesticides, and 415.2/SW-9060 for TPH. Field VOCs are listed in Table 3-2.			



LEGEND

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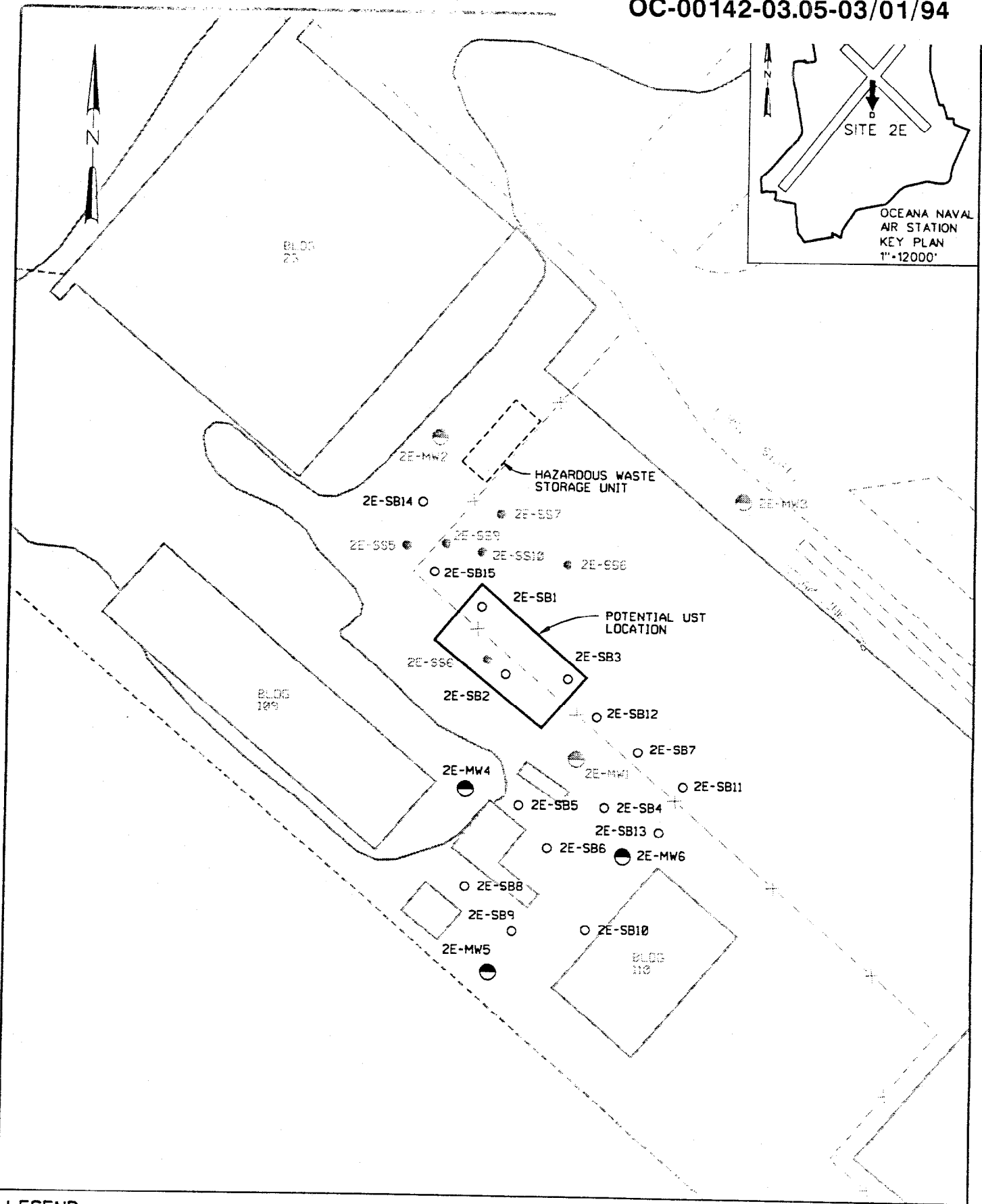
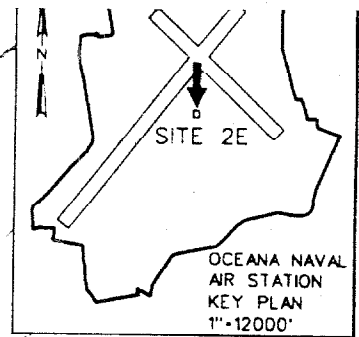
improve characterization of the VOC contaminant plume and help define the groundwater flow direction. All of the Site 2D monitoring wells (2 new and 3 existing) will be sampled and analyzed for Method 8240 VOCs. Metals will not be sampled because chlorinated volatiles are the contaminant of concern at Site 2D and no PAHs or base-neutral acid extractable organics (BNAs) were detected during the January 1993 RFI sampling. The analytical results for PAHs and BNAs suggest that oil-related wastes are not present near the wells, therefore, metals associated with waste oil are not expected. The detection limit for vinyl chloride will be 2 ppb, which is equal to the Maximum Contaminant Level (MCL). The elevations of the new monitoring wells will be surveyed and a complete round of groundwater levels will be measured.

4. **Survey Wetland Depression.** The vertical elevation of the base of the wetlands depression will be surveyed to estimate if it could be an area of groundwater discharge. If it appears to be a potential area of groundwater discharge, it will be sampled for 8240 VOCs.
5. **Perform slug tests** in 3 wells at Site 2D to determine aquifer characteristics such as hydraulic conductivity and flow velocity. Flow direction will be determined by comparing water-level measurements.

Site 2E—Line Shack 109 Disposal Area

There are two contaminant problems to be addressed at Site 2E, free product contamination and residual soil contamination. The primary focus of additional investigative activities at Site 2E is to characterize the extent of free product contamination and to identify the source of the free product. The groundwater contamination also will be addressed. To achieve these objectives, CH2M HILL field personnel will:

1. **Drill 15 soil borings and collect 3 soil samples.** The soil borings (2E-SB1 through 2E-SB15) will assist with the characterization of the free product and vadose zone contamination. Figure 3-2 presents the soil boring locations. Locations shown are provisional and will be changed on the basis of field observations. Personnel will use a power auger to probe for free product, and to delineate the boundary of the below-grade structure discovered during the RFI. After field personnel complete the exploratory work with a power auger, a hand auger will be used to collect three soil samples near the outer fringe of the area contaminated with free product fuel. The 3 sampling locations will be selected based on observations of the 15 exploratory boring locations. The samples will be collected from the depth of the free product contamination, an estimated 4 to 6 feet. A hand auger will be used for sampling to minimize volatilization. Additional exploratory borings without samples will be added in the field at the discretion of the field personnel, especially, in the areas northeast and northwest of the free product in 2E which are not accessible to a truck mounted drill rig due to an elevated pipeline and high-security fence.



LEGEND

- EXISTING SHALLOW MONITORING WELL
- EXISTING SOIL SAMPLING LOCATIONS
- PROPOSED SHALLOW MONITORING WELL
- PROPOSED SOIL BORING LOCATION

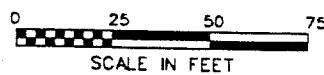


Figure 3-2
PROPOSED RFI PHASE II
SAMPLING LOCATIONS
AT SITE 2E



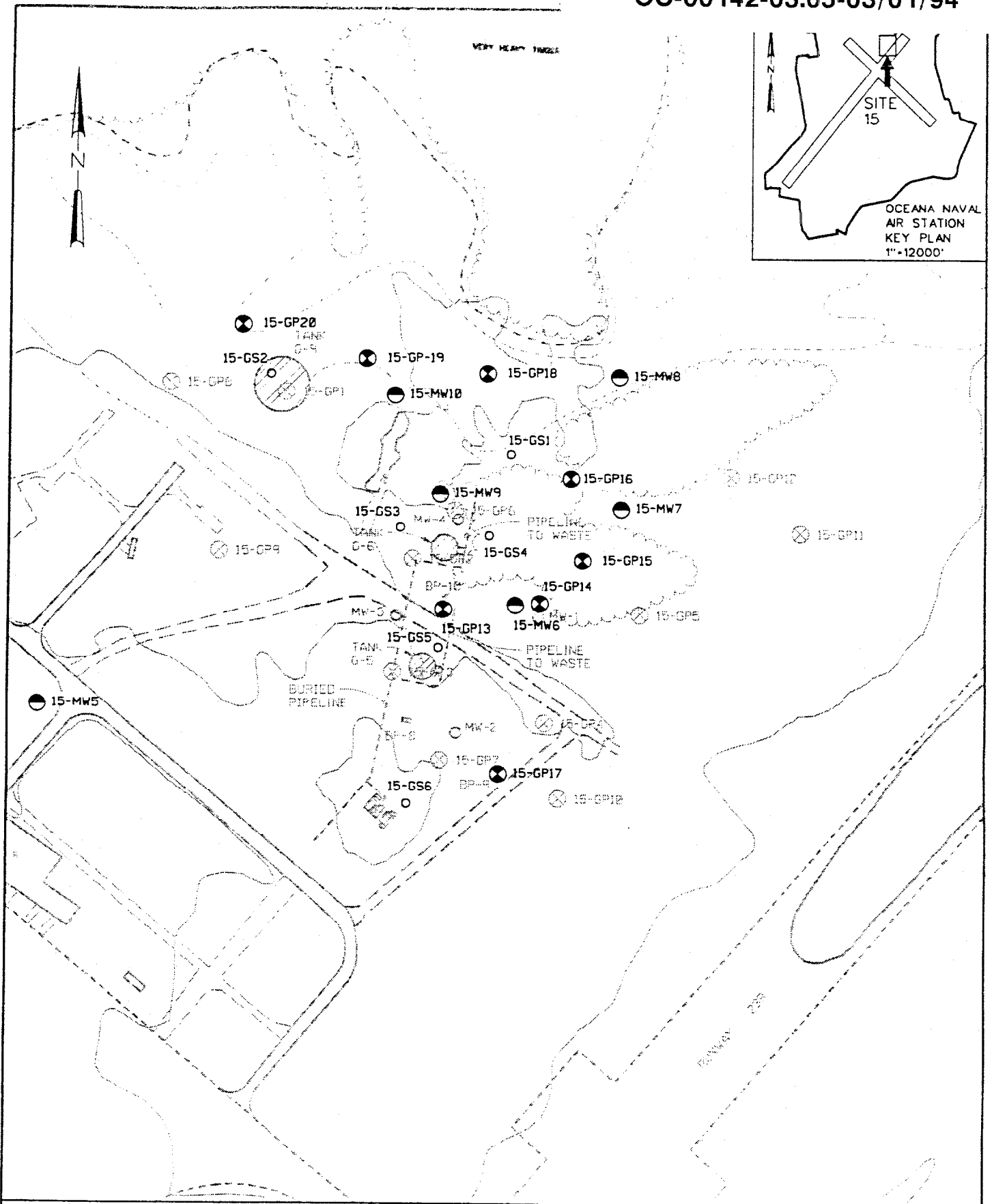
Each soil sample at Site 2E will be analyzed for Total Petroleum Hydrocarbons (TPH), VOCs, and Polynuclear Aromatic Hydrocarbons (PAHs). The samples will be analyzed for VOCs because all the constituents detected in past investigations were volatile organics. TPH and PAH will be used to determine contaminant levels of constituents common in free product fuels.

2. **Install 3 shallow monitoring wells.** The recommended monitoring wells (2E-MW4 through 2E-MW6) will be installed downgradient of 2E-MW1, based upon the assumption that the contaminant plume is moving south-southwest in the apparent direction of groundwater flow. The proposed locations for the monitoring wells are included on Figure 3-2. Locations are provisional and will be finalized on the basis of field observations. The three wells will be located outward from the area of free product to focus on the extent of dissolved contamination. After installation, the three new monitoring wells will be sampled and analyzed for VOCs, TPH, total and dissolved metals, and PAHs. The elevations of the new wells will be surveyed and a new round of water levels and free product thicknesses in all wells will be measured. The existing wells will not be resampled because results from 1990 and 1992 in wells 2E-MW2 and 2E-MW3 were similar, there were no PAHs or VOCs in 2E-MW2 and 2E-MW3, and well 2E-MW1 is known to be contaminated with free product; therefore, resampling it is not worthwhile.
3. **Perform slug tests** in three monitoring wells at Site 2E to determine aquifer characteristics such as conductivity and flow velocity. Flow direction will be determined from the comparison of water-level measurements. Determination of the aquifer's characteristics will assist with the determination of plume migration direction and rate.

Site 15—Abandoned Tank Farm

In-situ sampling at Site 15 during the RFI was successful in identifying the fringe of the groundwater contamination; however other areas of the site need further definition. Specifically, the area immediately downgradient of the most contaminated location at Site 15 is uncharacterized. The proposed Phase II activities are designed to complete the characterization of Site 15. The proposed Phase II activities will consist of:

1. ***In-situ* groundwater sampling.** Eight *in-situ* groundwater samples (15-GP13 through 15-GP20) will be analyzed by a mobile laboratory for the field VOCs listed in the Sampling Procedures section. *In-situ* sampling locations are shown in Figure 3-3. The *in-situ* groundwater sampling method was useful as a screening technology during the RFI and should provide a quick assessment of additional contaminated areas. Samples will be collected from 4 to 7 feet, slightly shallower than the 6- to 9-foot interval used during the RFI. This depth was chosen to be closer to potential floating fuel contamination on the basis of an anticipated depth to water of 2 to 6 feet. *In-situ* groundwater sampling will aid in characterizing the extent of free product contamination.



LEGEND

- EXISTING HYDRAULIC PROBE GROUNDWATER SAMPLING LOCATION
- PROPOSED HYDRAULIC PROBE GROUNDWATER SAMPLING LOCATION
- PROPOSED MONITORING WELL
- PROPOSED HYDRAULIC PROBE SOIL SAMPLING LOCATION

0 100 200 300
SCALE IN FEET

Figure 3-3

PROPOSED RFI PHASE II
SAMPLING LOCATIONS
AT SITE 15



2. ***In-situ* Soil Sampling.** Collect soil samples to a depth of 8 feet at six locations to examine remaining soil contamination at the source areas. Two samples per borehole will be analyzed in the field for BTEX. Six samples will be sent to the CH2M HILL analytical laboratory in Montgomery, Alabama for PAH and TPH analysis. Three soil samples also will be analyzed for 8240 VOCs.
3. **Shallow Monitoring Well Installation.** The preliminary locations of the six monitoring wells to be installed during Phase II are also shown in Figure 3-3. The locations are preliminary and may change based upon the *in-situ* groundwater sampling results. The monitoring wells will be designed and constructed with 15-foot screened zones that extend above the water table to enable the capture of free product. Well 15-MW5 is intended to be a background well. Groundwater samples collected from the six new monitoring wells will be submitted for the following analyses: VOCs, PAHs, TPH, total lead and dissolved lead. Full metals analysis of groundwater is not proposed because Site 15 appears to be contaminated with fuels not waste oil, therefore, the presence of metals associated with waste oil is not expected. Lead should be a good indicator of fuel contamination. In addition, the elevations of the monitoring wells will be surveyed, and a round of water levels from the six new wells will be measured.
4. **Perform slug tests** on four wells as Site 15 to determine aquifer characteristics, including conductivity and flow velocity. Comparison of water-level measurements from the monitoring wells will assist with the determination of flow direction and hydraulic gradient. Determination of the localized aquifer characteristics also will provide information regarding the plume migration direction and rate.

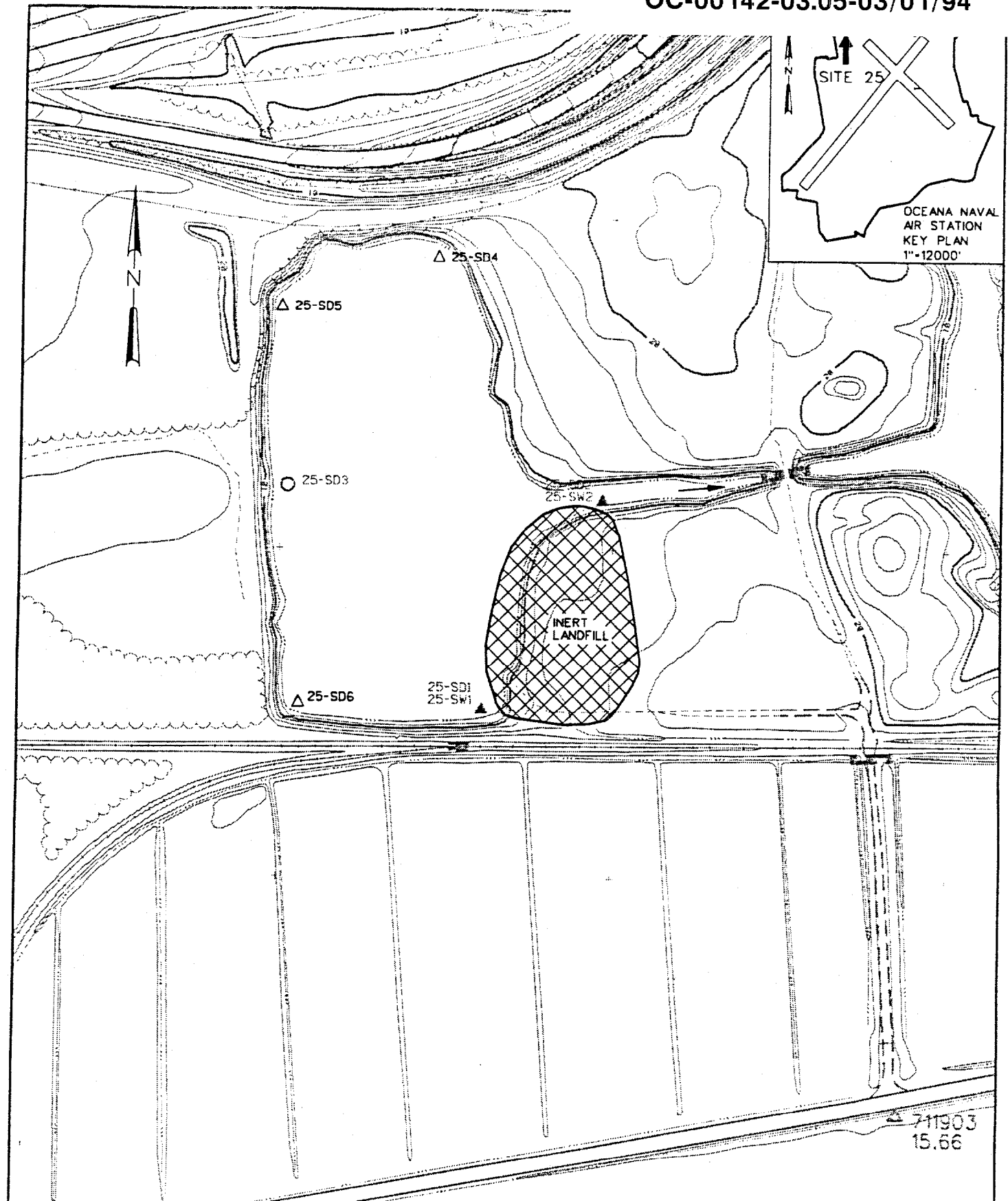
Site 25—Inert Landfill

Completion of the RFI at Site 25 will require additional sampling of the pond sediment to confirm the presence and determine the extent of low-level pesticides and metals contamination. CH2M HILL proposes collecting three sediment samples from new locations at the edge of the pond. The proposed sampling locations are presented on Figure 3-4. The samples will be analyzed for percent organic carbon, TAL metals, and TCL pesticides. Percent organic carbon will be analyzed because environmental criteria for sediments are a function of percent organic carbon. The TAL metals and TCL pesticide analyses are recommended to confirm the RFI Phase I analytical results.

Sampling Procedures

Soil Sampling

The RFI Phase II field investigation will include the collection of soil samples at sites 2D and 2E. At each site, the method of sampling will be different. Both sampling programs



LEGEND

- EXISTING SEDIMENT SAMPLING LOCATION
- ▲ EXISTING SEDIMENT AND SURFACE WATER SAMPLING LOCATION
- △ PROPOSED SEDIMENT SAMPLING LOCATION



APPROXIMATE LANDFILL BOUNDARY

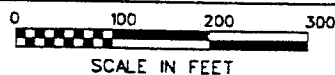


Figure 3-4
PROPOSED RFI PHASE II
SAMPLING LOCATIONS
AT SITE 25



will be based on an interactive approach. CH2M HILL personnel will field screen soil samples to determine which samples are most contaminated, and only submit predetermined number of samples for laboratory analysis. Field screening techniques will include visual observations, odors, and OVA or OVM screening. Soils at Site 2E will be collected with a hand auger after defining the area with a power auger. Soils at 2D will be collected with a *in-situ* hydraulic probe sampler. Both approaches are described in this section.

Some soil samples will be collected from locations covered with asphalt or concrete; therefore, where applicable, the first sampling activity will be to select sampling locations and penetrate the asphalt or concrete with a pneumatic jackhammer or concrete corer. The asphalt or concrete will be removed down to the base of the slab before beginning sampling at Site 2E and at all concrete locations at Site 2D. The hydraulic probe sampler will penetrate asphalt directly.

A manually controlled power auger will be used to define areas of free product and identify the extent of the below-grade structure at Site 2E. Samplers will use the gasoline-powered auger to probe the subsurface repeatedly at the locations shown in Figure 3-2. Following the power augering, soil samples will be collected using a hand auger from the estimated depth of free product near the fringe of the area contaminated with free product.

At each location, the samplers will auger to the water table, or as deep as possible without borehole collapse. The depth of free product will be noted during the power augering. Based on these observations, three soil samples will be collected from the estimated depth of the free product, which is expected to be approximately 4 to 6 feet. These three soil samples will be submitted for laboratory analysis.

Soil cuttings and any residual soil samples that were collected, but not submitted for analysis, will be placed in large polyethylene bags labeled with the boring number. As the bags are filled, they will be tied off with plastic ties and placed in 55-gallon steel drums. The drums will be marked to indicate the soils that they contain.

Site 2E soil samples will be analyzed for VOCs, PAHs, and TPH. The VOC soil samples will be removed from the hand auger using a stainless steel apparatus and placed directly into the appropriate sample container to reduce the volatilization of organic compounds. All remaining soil volume will be placed in a stainless steel bowl and mixed thoroughly. After mixing the soil, the PAH and TPH sample containers will be filled and the remaining soil discarded into a separate polyethylene bag.

Groundwater Sampling

If free product, either DNAPL or LNAPL, is present in any of the wells, its thickness will be measured using an electronic interface probe before sampling begins. This probe is based on an audible signal and includes a precisely-ruled measurement tape. Free product, if present, will be sampled using a disposable bailer.

Groundwater sampling will be as described on page 4-44 of the RFI work plan (CH2M HILL, 1992), except that either a positive displacement bladder pump or a Grundfos Redi-Flo 2® submersible pump will be used instead of a bladder pump for purging and sampling. After determining the well volume, well purging will begin and the discharge will be collected in a graduated container for volume measurements. The field parameters pH, specific conductivity, and temperature, will be measured after each well volume of purged water or after the well has recharged from being pumped dry. Calibrated electronic meters will be used to measure the parameters. Sampling will occur after the parameters have stabilized to within 10 percent for at least three well volumes, or until the well has been purged dry. If the water level falls below the pump intake, the pump will be lowered as necessary. The parameter measurements, the flow rate, and the corresponding well volumes will be recorded in the log book. If a well goes dry before three volumes are obtained, sampling will occur when the well has recovered sufficiently to collect the volume needed. The purge water will be contained in drums.

After purging the necessary volumes of groundwater from the well, sample collection will begin. Either a positive displacement bladder pump or a Grundfos Redi-flo 2® submersible pump will be used for sampling. The Redi-flo 2® can sustain continuous flows of 100 ml/min to 9 gpm; however, purge rates will be held to a maximum of 2 gpm during Oceana sampling. The pump is capable of the 100 ml/min flow rate recommended for volatile sampling by the EPA (EPA, 1987). The flow rate is adjusted by lowering the speed of the mechanism with a rheostat rather than choking off a constant-rate mechanism. This flow adjustment mechanism and the low flow ensure that the sample is not agitated causing volatiles to be lost. Tests performed to determine the ability of the Redi-flo 2® to replicate sampling results derived from other sampling procedures, including bladder pumps, have indicated that the Redi-flo 2® produces groundwater samples with extremely similar results for organic and inorganic compounds.

VOC samples will be collected last to allow water pumped at the higher purge rate to clear through the tubing. At Site 2D, where only volatiles will be collected, an additional 1 gallon of groundwater will be cleared through the hose at a rate of approximately 500 ml/min if the Redi-flo 2® pump is used. This procedure will ensure that all sampled water will have passed through the pump at low flow rates. The flow rate when sampling VOCs will be 100 ml/min thereby minimizing agitation at the hose outlet.

At each site, groundwater sampling will begin at the wells with the lowest suspected levels of contamination and proceed to the wells with the highest levels of contamination. This order of sampling reduces the possibility of cross-contamination. Sampling will also be from the top of the screened zone. The VOC bottles will be checked for air bubbles, and refilled if any bubbles are present. Samples collected for metals analysis will be filtered through a disposable 0.45 micron-filter.

Sediment Sampling

CH2M HILL field personnel will use decontaminated stainless-steel trowels or hand augers to collect sediment samples, depending on the depth of the water at the sediment sampling location. The sediment will be deposited into a stainless-steel mixing bowl, mixed thoroughly and placed in the appropriate sample containers. The sediment samples collected during the RFI Phase II field investigation at Site 25 will be submitted for 3 analyses: percent organic carbon, TAL metals and TCL pesticides. After sample collection, any remaining sediment will be returned to the surface water body.

In-Situ Hydraulic Probe Sampling

Groundwater will be collected using a Geoprobe® hydraulic probe sample at Sites 2D and 15. The sampler also will be used to sample soils at sites 2D and 15. The Geoprobe® hydraulic probe sampling procedure consists of driving a 3/4-inch diameter hollow slotted steel rod to the desired depth and then sampling through polypropylene tubing equipped with a foot valve. The hydraulic probe sampler will be mounted on a four-wheel-drive pickup truck. Samples will be collected through the 3-foot slotted lead rod. At Site 2D, the groundwater samples will be collected from a depth of 13 to 15 feet to correspond with monitoring well screened zones, whereas at Site 15, the groundwater samples will be collected from 4 to 7 feet to intercept potential free product influences soil. The tubing will be changed between sampling locations and all rods will be decontaminated by scrubbing them in a solution of no-phosphate detergent, followed by rinses in tap water and deionized water.

Soil samples at Site 2D will be collected from 3 to 5 or 4 to 6 feet. The samples will be analyzed for field VOCs. Field duplicates will be collected from two of the 6 soil sampling locations. The field duplicates will be analyzed for 8240 VOCs in the CH2M HILL laboratory in Montgomery, Alabama as a check on the mobile laboratory results.

The hydraulic probe samples will be analyzed for specific aromatic and chlorinated VOCs in a mobile laboratory equipped with an electron capture detector (ECD) and a flame ionization detector. Total petroleum volatiles (TPV) will also be analyzed. TPV is a composite analysis that indicates the approximate total concentration of all volatile petroleum constituents in the sample. The constituents and their detection limits are given in Table 3-2.

The listed aromatic volatiles, chlorinated volatiles, and TPV will be analyzed at both Sites 2D and 15 even though aromatics are not a concern at Site 2D and chlorinated volatiles are not a concern at Site 15. Both groups of volatiles will be analyzed at both sites because the detectors will be attached in series with the gas chromatograph to be able to analyze samples from both sites concurrently.

Table 3-2 FIELD VOCS AND THEIR DETECTION LIMITS	
Compound	Quantitation Limit (ug/l)
Chlorinated volatile organics:	
Vinyl chloride	2.0
1,1-Dichloroethylene	2.0
trans-1,2-Dichloroethylene	2.0
cis-1,2-Dichloroethylene	2.0
1,1-Dichloroethane	2.0
1,1,1-Trichloroethane	0.5
Trichloroethylene	0.5
Fuel-related aromatic organics:	
Benzene	10.0
Toluene	10.0
Ethylbenzene	10.0
Total xylenes	10.0
Total petroleum volatiles (TPV)	10.0

Other Field Procedures

UST Location and Free Product Characterization at Site 2E

As described earlier in the Sampling Locations section, a power auger will be used to sample soils at Site 2E. CH2M HILL field personnel will also use the auger to probe the subsurface for free product, which has been detected in 2E-MW1. The auger will provide a quick method of free product characterization. In addition, the auger will be used to probe for and delineate a subsurface structure that impeded soil sampling efforts during the Phase I RFI. The subsurface structure, which is along the fenceline near 2E-MW1, was repeatedly encountered at a depth of approximately 2 feet. CH2M HILL suspects this structure may be a former UST, and possibly the source of the free product.

Repair of Borings

Each hand-augered boring will be backfilled to the surface with cement grout. *In-situ* hydraulic probe holes will be backfilled to 6 inches below the surface with bentonite powder, then filled to the surface with sand at locations with a soil surface. At locations where asphalt or concrete was penetrated to collect either a hydraulic probe or a soil sample, the fill will be brought to the base of the former slab and the concrete or asphalt will be repaired. Asphalt will be repaired with asphalt patch, and concrete by mixing pre-mixed concrete with additional cement and coarse aggregate to restore the quality of the existing slab.

Decontamination Procedures

The decontamination procedures will be generally as specified in Chapter 4 of the RFI work plan. Refer to that section for specific procedures or details.

One change from RFI decontamination procedures will be the elimination of the hexane rinse. Experience from the RFI showed that hexane is not miscible with water and, therefore, the 10 percent solution proposed in the RFI work plan is not workable because it is not a true solution. Hexane is lighter than water, therefore, the decontamination rinse sprayer sprays either pure hexane or pure water, depending on the level in the sprayer. Also, hexane forms globules in the groundwater sampling pumps that do not flow through the pump easily and could be a source of cross-contamination. If the Redi-flo 2® pump is used for groundwater sampling, the decontamination fluids specified in the work plan minus hexane, will be circulated through the pump for 5 minutes each to clean the pump thoroughly.

Handling Investigation-Derived Wastes

All soils removed from the subsurface using hand or power augers will be discarded into large polyethylene bags and then placed in 55-gallon steel drums to prevent exposure to potentially contaminated soils. Soils from well installations at Sites 2D, 2E, and 15 will be voluminous enough to fill entire drums, so polyethylene bags will not be used for soil cuttings at these locations. Personal protective equipment, construction fill underlying asphalt or concrete, and tubing and expendables used in the *in-situ* sampling will also be placed in 55-gallon drums. The concrete or asphalt rubble itself will be disposed in dumpsters on the base after being placed in bags. The drums will be sealed, marked with paint, and identified with proper labeling. All bags placed inside the drums will also be labeled. The purpose of this labeling is to segregate the soils so they can be returned to their original location after analytical results are received. The drums will be stockpiled, at a location designated by NAS Oceana personnel, pending the analytical results of soil and groundwater samples and, if deemed necessary, the results of TCLP sampling of the drums.

As approved by the EPA for the RFI, sampling and purge water, development water after well installation, and the solids from the decontamination pad will be placed in drums only if they originate from contaminated wells. For example, purge water, sampling water, and decontamination liquids from the background well 15-MW5 at Site 15 would not be contained. The decision to contain other fluids would be based on field observations. At Site 15 and 2E, water from all wells with a fuel odor will be contained. At Site 2D, water from wells in areas with contamination above MCLs (based on in-situ sampling data) will be contained.

The soils from Sites 2D and 2E would be considered hazardous wastes if they were either listed or characteristic wastes. Characteristic hazards include toxicity, corrosivity, reactivity, and ignitability. Toxicity will be inferred from the TCL/TAL analyses but the

corrosive, reactive, and ignitable hazard of the soils will not be tested on the assumption that the soils are inert. Evidence to the contrary such as obvious corrosion, reaction or ignition in the field will be cause for reevaluation and possible testing. If concentrations of the contaminants in soil are high, the soil in the drums may be analyzed for TCLP to test for toxicity hazard.

Past consideration of the generation and disposal history at these sites has led to the conclusion by the Navy that the wastes discharged to the ground at Sites 2D and 2E, landfilled at Site 25, or stored at Site 15 were not listed hazardous wastes. As part of this investigation, NAS Oceana and LANTDIV will review Navy records for these sites to confirm that the discharged wastes and the soils, if they are contaminated by these wastes, should not be considered a listed hazardous waste.

The analytical results from the analyses in Table 3-1 will be reviewed for evidence of toxicity and a preliminary assessment of investigation-derived waste (IDW) hazards will be described in a technical memorandum to the Navy and the EPA. The drummed wastes will be handled by CH2M HILL following Navy decisions concerning IDW handling and/or disposal. In the interim, the drums will be sealed, labeled as potential hazardous wastes, and stockpiled in locations specified by NAS Oceana personnel.

If the analytical results are low, and if upon testing for TCLP, results are below TCLP limits, and it is determined that the waste stream was not listed, the soil will be dispersed on the ground adjacent to the boring locations. If dispersed, the soils will be removed from the marked bags and dispersed near the boring from which they were removed. Whole drums from well sites will be emptied and their contents dispersed near the well sites or within the site boundary. Personal protective equipment will be placed in marked bags and discarded in ordinary dumpsters if the TCLP or TCL/TAL results indicate no toxicity hazard.

If the samples contain contaminant concentrations above TCLP limits, the samples and the drummed soils from the borings from which they came will be considered hazardous. These wastes will be manifested, handled as hazardous waste, and shipped to a regulated hazardous waste landfill, treated, or stockpiled as appropriate and as directed by the Navy.

Quality Assurance/Quality Control and Data Validation

All field observations and data will be recorded in log books, including sample location numbers, signs of contamination, measurements, depth and time of sampling, dates, units and personnel involved in site work. Data will be recorded, tabulated, and validated as specified in Chapter 5--Data Management Plan of the June 1992 RFI Work Plan.

The quality assurance/quality control (QA/QC) procedures followed during this investigation will be essentially identical to those followed during the RFI. These QA/QC procedures are specified in Appendix A of the RFI work plan. One difference will be in

the frequency of equipment blanks, which will be collected every other day rather than every day.

Most detection limits will be as specified in Attachment B of Appendix A of the RFI work plan. One difference will be that a detection limit of 2 ppb will be used for vinyl chloride so that non-detects are known to be below the MCL of 2 ppb. Another difference will be in the detection limits for metals in soils. It is understood that the detection limits in soils depend on the soil properties, especially moisture content, and cannot be controlled as effectively as with water samples. Nonetheless, to the extent of analytical feasibility, attempts will be made to lower the instrument detection limits for the following metals: (1) antimony to 0.520 ppm, (2) beryllium to 0.550 ppm, (3) mercury to 0.081, and (4) selenium to 0.30 ppm.

All samples will be shipped to the CH2M HILL laboratory in Montgomery, Alabama. The soil and the groundwater sampling data from the Montgomery laboratory will be reported following NEESA Level C guidelines. This is a high level of QA/QC appropriate for cases in which litigation is not anticipated. *In-situ* groundwater samples collected with the hydraulic probe will be analyzed on the basis of NEESA Level B QA/QC. This level of QA/QC is appropriate for in-field laboratory work, as specified in NEESA guidance (NEESA, 1988). The analytical data will be validated by an outside contractor following NEESA Level C data validation standards, with the exception of the *in-situ* groundwater data which will not be validated. Field QC ratios for the soil samples will follow guidelines stated in Appendix A of the RFI work plan (CH2M HILL, 1992).

Validation will also follow EPA protocols specified in *Laboratory Data Validation Functional Guidelines for Evaluating Organics and Inorganics Analyses* and *U.S. EPA Region III Functional Guideline Modifications*. Data validation is described in more detail in Chapter 5 of the RFI Work Plan (CH2M HILL, 1992).

Health and Safety

Site work will be governed by the requirements of the health and safety plan, as modified from Chapter 6 of the RFI work plan (CH2M HILL, 1992). The existing health and safety plan has been modified slightly to apply to the timing and personnel of the Phase II RFI and other Oceana field activities anticipated in late 1993 and early 1994.

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Section 4 Project Execution

Project Personnel

The project will proceed under the overall management of the LANTNAVFACENGCOM Engineer-In-Charge (EIC), Mr. Jim Harris. The CH2M HILL project manager will be responsible for the successful execution of this work plan and will manage the Phase II RFI, taking responsibility for staffing, coordination, cost and schedule control, and technical quality. Mr. Steven Brown of CH2M HILL's Reston office will manage the Phase II RFI.

The senior review team will review the technical and management activities of the project, including all project deliverables. This team will be composed of senior-level personnel or discipline specialists from the prime contractor's resource pool. The senior review team will be involved with the project during all phases and will function independently of the project staff, reporting directly to the project manager. Mr. Doug Dronfield of CH2M HILL's Reston office will be the principle senior reviewer.

The sampling field team leader will have at least 5 years of professional experience. The field team leader will be responsible for the coordination of field efforts, will assure the availability and maintenance of sampling equipment and materials, and will be responsible for shipping and packing materials. The field team leader will supervise the field work and sampling operations of the field technicians and will be responsible for completion of the field notebook. The field team leader will maintain close coordination with the project manager.

The site safety coordinator (SSC) has revised the health and safety plan in Chapter 6 of the RFI work plan for conditions during the Phase II RFI and will ensure that the plan is implemented during field activities. The SSC will oversee all field activities involving contractor and subcontractor personnel. This individual has the authority to terminate field activities if health-threatening situations arise or if the site safety plan is not being executed properly. The SSC will coordinate field activities with the field team leader and report directly to the contractor's project manager. The field team leader may also function as the SSC.

A quality assurance team was involved in preparation of the data collection quality assurance plan (DCQAP) (Appendix A of the RFI work plan (1992)) for field and laboratory tasks. The Quality Assurance Officers will ensure the requirements of the DCQAP are met during the field investigation, laboratory analysis, and data validation tasks. Periodic site and laboratory audits may be conducted to observe activities and to ensure that data quality objectives are satisfied. The data quality assurance officers will report periodically to the contractor's project manager for debriefing of data quality.

Community Relations

Community relations will be as specified in the Community Relations Plan (CH2M HILL, 1991), as amended and updated by the Navy for current conditions.

RFI Addendum Report

After the field investigation is completed and all analytical data has been validated, an RFI addendum report will be written presenting the results of the Phase II RFI investigation. The analytical results will be presented in tables similar to the tables in the RFI report. These results will be reviewed and compared to human health criteria for soils and groundwater presented in Appendix A and Chapter 4 of the RFI report (CH2M HILL, 1993). References will be made to sections of the RFI report, particularly Appendix A; however, all tables will present the complete historical data record and conclusions will be based on all the data. Recommended future actions at each site, particularly whether contamination merits a CMS of remediation options, will also be presented.

Schedule

Table 4-1 is the schedule of activities for the Phase II RFI of sites 2D, 2E, 15, and 25. This schedule is for the work plan addendum submission, field investigation, report preparation, and response to comments.

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<p>Table 4-1 SCHEDULE FOR THE PHASE II RFI OF SITES 2D, 2E, 15, AND 25</p>	
Task	Submittal Date
Submit Draft Work Plan Addendum to LANTDIV	November 15, 1993
CH2M HILL Receives LANTDIV Comments on Work Plan Addendum	November 29, 1993
Submit Draft Final Work Plan Addendum to EPA Region III	December 6, 1993
Receive EPA Comments	January 28, 1994
Submit Final Work Plan Addendum	February 18, 1994
Begin Field Work	February 7, 1994
End Field Work	March 18, 1994
Submit Draft RFI Phase II Report to LANTDIV	May 27, 1994
Receive LANTDIV Comments on Draft RFI Phase II Report	June 10, 1994
Submit Draft Final RFI Phase II Report to EPA Region III	June 24, 1994
Receive EPA Comments on Draft Final CMS Report	October 5, 1994
Submit Final CMS Report	October 19, 1994

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